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Synthesis, evaluation of kinetic characteristics and investigation of apoptosis of Cu^{2+} -modified ceria nano discs

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1 **Synthesis, evaluation of kinetic characteristics and investigation of apoptosis of Cu²⁺-modified ceria**
2 **nano discs**

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6 **Abstract**

7 Ceria nano discs were synthesized by the stepwise thermal decomposition strategy of the oxalate precursor.
8 A series of Ce_{1-x}Cu_xO₂ ($x = 0, 0.02, 0.1, 0.2$ and 0.3) nano sized oxide systems were prepared through
9 thermal decomposition route. Kinetic characterization of formation of solid solution was made by
10 isoconversional strategy under non-isothermal condition. Introduction of various reactant molar ratios of
11 Cu²⁺: Ce⁴⁺ has pivotal role on the creation of new oxygen vacancies, decomposition strategy, particle size
12 and shape. Cu²⁺ doping ($x = 0.02$ and 0.1) damages the disc shaped morphology of ceria. Homogeneous
13 distribution of Cu²⁺ on the oxalate precursor has significant role on the catalyzing activity for the
14 destruction of oxalate bond to oxide. 2 mol% doped Cu²⁺ promotes breaking of oxalate bonds in nitrogen
15 atmosphere. *In vitro* cell viability assay illustrates enhanced toxicity to cancer cells with 10 mol% Cu²⁺
16 doped ceria.

17 **Keywords:** Nano disc; Isoconversional; Oxygen vacancies; Decomposition strategy; Cell viability; Rare
18 earths

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25 **1. Introduction**

26 Material chemists have provoked with enthusiasm to research for scaffolding ceria as potential
27 catalyst. It constitutes as the one of the major components of TWCs for the removal of toxic automobile
28 exhaust gases [1-3], oxygen sensors and oxygen permeation membrane systems [4]. On reducing the size
29 of CeO₂ to nanometers, it possessed highly interesting properties because it allows the modification of
30 surface area to volume ratio. Additionally it is worth to note that properties of ceria are monitored by
31 structural and morphological parameters [5-8]. Manifestation of oxygen vacancies have predominant role
32 in performing ceria as an eventual material. For example, (1 0 0) crystal plane of nano cube ceria exhibits
33 reactivity than (1 1 0) and (1 1 1) planes of nanosphere like ceria. This arises a fact that presence of oxygen

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